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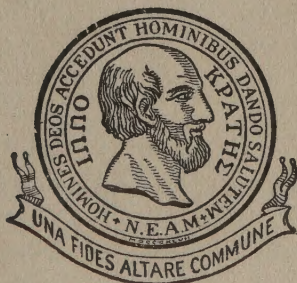
BULLETIN
OF
THE NEW YORK
ACADEMY OF MEDICINE

SUPPLEMENT

TO

JANUARY, 1928

SYMPOSIUM IN MEMORY OF LISTER



INSTITUTED 1847

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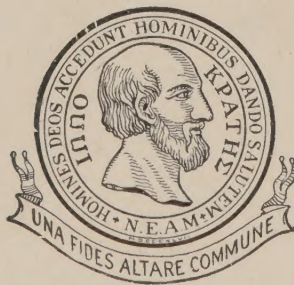
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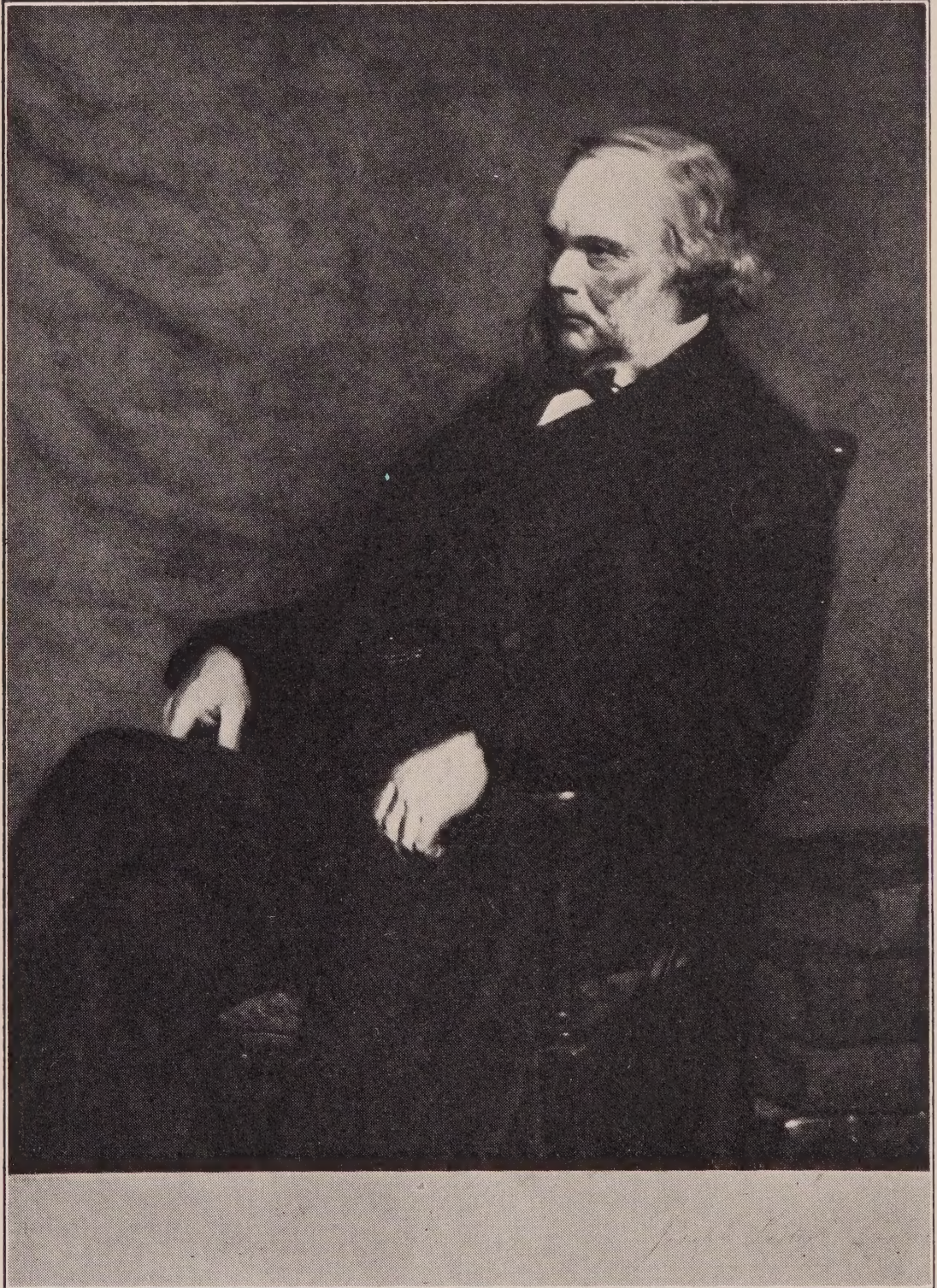
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FROM ENGRAVING AFTER PORTRAIT BY LORIMER (1895)

SUPPLEMENT TO THE BULLETIN OF THE NEW YORK ACADEMY OF MEDICINE

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JANUARY, 1928

No. 1

SYMPOSIUM IN MEMORY OF LISTER

Section of Historical and Cultural Medicine

November 30, 1927

BIOGRAPHICAL SKETCH AND MEMORABILIA OF LISTER

ARCHIBALD MALLOCH, M.D. (McGILL), M.R.C.P. (LOND.)

Librarian of The New York Academy of Medicine

It has fallen to my lot this evening to take part in the centenary celebration of the birth of Lister, and my qualifications are slight except that I was brought up in a house where Lister was revered and often spoken of in terms of deepest affection. Since that time, through the kindness of friends, I have made a collection of books, articles, and clippings about the Master and during the last few years scarcely a month has passed without something being added to it.

Joseph Lister, the second son of the family, was born on the 5th of April, 1827, at Upton, a small village in Essex close to London. His parents belonged to the Society of Friends and to them he owed the careful upbringing and attention to education which went with a well-to-do family of that sect. The Listers came originally from Yorkshire and incidentally I have a letter from Lister to Sir William Osler which shows that he was not aware of any connection of either Dr. Martin Lister, the zoologist who lived from 1638(?) to 1712, or Sir Mathew Lister, the physician, who died in 1656, both Yorkshiresmen. His father, Joseph Jackson Lister (1786-1869), was a wine merchant of London and also was a scientist to whose labours we owe the improvement of the achromatic microscope. His

illustrious son wrote later that he "raised the compound microscope from little better than a toy to a powerful engine for investigation." How lucky for such a son to have such a father who early awakened and quickened in him an interest in Nature and natural history! Lister's early education was at home and then at two private Quaker schools. Leaving Upton House in 1844, Lister, now well versed in the classics and with a considerable knowledge of French and German, entered University College, London, and obtained the degree of Bachelor of Arts in 1847. In 1848 he "entered on the physick line" at University College Medical School and Hospital. Studying under the physiologists, Sharpey and Wharton Jones, Graham, the noted chemist, and the surgeon, Liston, he soon took an important place, for he worked hard and did his own thinking. One of his teachers at this time said: "He excels anyone I have known, in his bright promise for the future." He was awarded several gold medals during his course and when he graduated M.B. in 1852 he obtained the Gold Medal and Scholarship in Surgery. In the same year he became a Fellow of the Royal College of Surgeons of England. He was house-physician to Dr. Walshe and house-surgeon to the famous Mr. Erichsen. Whilst in the wards, he saw with his own eyes those dire diseases which practically always followed compound fractures or operations—septicaemia, pyaemia, erysipelas, "hospital gangrene," and tetanus. It is characteristic of him even before he began his life work, which resulted in the practical wiping out of these, that he read a paper on "gangrene" before the Hospital Medical Society. It was no doubt owing to his facility with the microscope and his skill in cutting sections derived from his father and the inspiration of Sharpey, the Professor of Physiology, that his first papers, "On the Contractile Tissue of the Iris" and "On the Muscular Tissue of the Skin," both published in the *Quarterly Journal of Microscopical Science* in 1853, and subsequent physiological papers were written.

It was intended that Lister should spend a month with Mr. James Syme in Edinburgh and then visit some of the clinics on the Continent before settling down to a consulting surgical practice in London, so armed with a letter from Sharpey he presented himself to the giant surgeon of the North in September,

1853. Lister decided to stay out the winter in Edinburgh and became "supplemental clerk" to Syme, who showed great interest in, and affection for, this young Englishman. Later he was appointed house-surgeon and finally he determined to remain, and was made assistant surgeon to the Royal Infirmary in 1856 and began his career of consulting surgeon. One day Lister was climbing the crags at Arthur's Seat and fell, receiving serious injury. It was a close shave and the world almost missed having the antiseptic system and all it has meant.

In April, 1856, after resigning his membership of the Society of Friends, Lister married Agnes, the eldest of Prof. Syme's daughters. Her's was a beautiful character and she helped him in all his work, even acting as his secretary and taking down notes of his experiments. Their married life, though they had no children, was one of greatest happiness.

Lister quickly established himself as a sound surgeon and as a teacher of more than ordinary merit. His lectures were popular with the students, not because he was eloquent, although they were couched in faultless English, but because he was simple, earnest, and enthusiastic, and he expounded the principles of his subject. He had a clear musical voice. Lister did not teach specially for the examinations which lay ahead of his students. The patient was never lost sight of in his review of a case and no doctor was ever more beloved by those under his care, or by his students. The other day I saw a quotation aptly applied to Lister: "L'amour de la médecine fait le savant, l'amour du malade fait le médecin;" and he himself dressed his patients' wounds with infinite care and never left them until they were comfortable. His noble example made the students conscious of the high calling wherein they were called. It is pleasant to think of the affection in which he held his own teacher and the phrase, "Only one of the many things, gentlemen, I learnt from Mr. Syme," was often on his lips. I have said he dealt with first principles, and the most important paper during this stage in his career was "On the Early Stages of Inflammation" (*Philosophical Transactions*, 1858, cxlviii, part ii, p. 645), for he saw that could the causes of inflammation be learnt, it could be overcome. He felt sure that inflammation occurred because of decomposition of the blood in the wounds

and he sought its cause. The hospital diseases loomed larger than ever before as the introduction of chloroform anaesthesia made possible a greater number of operations and an increase in the occurrence of erysipelas, septicaemia and hospital gangrene followed in their train. The object of his life work was always kept steadily before his eyes and soon he was to allow a flood of light to beat down upon these places which had from time immemorial been as dark as night:

Out of the night, out of the blinding night
Thy beacon flashes; . . .

On the death of the former incumbent of the chair, Lister was appointed by the Crown in 1860 to the Regius Professorship of Surgery in the University of Glasgow. He was heartily received by his large class of students and he made the same deep impression upon them as he had done at Edinburgh. For over a year he had no hospital beds, as none went with the Chair, but this was remedied partly through the pressure exerted by his students and he was elected surgeon to the Glasgow Royal Infirmary in 1861. Although new wards were allotted to him, his grief was great that hospital diseases became rife. He pushed on and did not despair. The view was current that oxygen caused putrefaction in the wounds, for none occurred if the skin over a fracture remained unbroken. At this point, in 1865, a revolution in ideas was brought about through the brilliant researches and discoveries of that genius, Louis Pasteur, for he showed that spontaneous generation did not take place and that fermentation was caused by minute organisms of the air. Thus the opportunity came and there, in Lister, was one ready to take advantage of it "because he was on the mountain heights; and he was watching there alone" as Sir Clifford Allbutt aptly put it. Lister developed the ideas of the germ theory farther than Pasteur had ever dreamed. Lister concluded that these germs, gaining access to open wounds, were the cause of putrefaction and the resultant severe infections. If the germs already present in the wound could be destroyed and if the access of others could but be barred during healing, all would be well; and to accomplish this is what Lister set out to do and succeeded in doing. In 1864 crude carbolic acid had been used in the treatment of sewage at Carlisle with good results and Lister now

selected it for the treatment of wounds. We all know the brilliant results which followed. The methods employed at first now seem to us rough and ready in the extreme but step by step they were simplified and perfected. By 1867 Lister was able to report eleven cases of compound fracture successfully treated by his new method. Lister's principles, which he held to through thick and thin, proved to be correct and were justified before the bar of reason and shown to be true by experiment and surgical practice. In 1867 for the first time he was able to state that in his wards, "during the past nine months not a single instance of pyaemia, hospital gangrene, or erysipelas has occurred," and could safely increase the accommodation of the wards by placing mattresses between the beds. It is difficult for us now to contrast this state of affairs with the horrors of sepsis in hospital surgical practice, which were seen before that date, because we can scarcely realize them. Many—even the great Simpson—wrote articles opposing his teaching but Lister midst his multifarious duties answered them every one.

In one of the exhibition cases we have put a volume of letters from Lister to my father, Archibald Edward Malloch (1844-1919), who was born in Brockville, Ontario, and went to Glasgow University for his medical course after he had obtained his degree of Bachelor of Arts at Queen's University, Kingston, Ontario. My father was Lister's dresser in the Glasgow Royal Infirmary in 1865 just when carbolic was being used for the first time and dresser in Lister's acute ward in 1866. Also during the same year as a student he was house-surgeon for two weeks and lived in the Infirmary. As a result of this, Mr. Lister promised him a position of house-surgeon after graduation. It is interesting to note that Lister would not take a man unless he had first served as house-physician, so my father after he was under Professor William T. Gairdner became Lister's house-surgeon from May to November, 1868. I have opened the volume of letters to show the testimonial Lister wrote when my father left the Royal Infirmary. This is a great source of pride to our family. The other letters are largely of a personal nature, usually expressing thanks for a barrel of apples which were sent over as a Christmas present every year.

17 WOODSIDE PLACE,
GLASGOW

27th Nov 1868

I feel peculiar pleasure
in expressing the very high
opinion I entertain of Mr.
Archibald E. Malloch.

He is endowed with very
superior intellectual powers
which he has devoted with
the utmost zeal to the
acquisition of profound
knowledge; so that he was
one of the most distinguished
of all the students of his
period in the University of Glasgow

After taking his degree,
he acted for a year as
a resident Assistant in the
Glasgow Royal Infirmary,
one of the best fields for
practical study in the world,
serving for six months
under a Physician and
then for a similar period
under myself. Of the
manner in which he discharged
the duties of House Surgeon
I cannot speak too strongly;
the efficiency of his work,
from his manual dexterity

no less than from his
intelligent acquaintance
with the subject, being
further enhanced by his
genuine modesty and
by his kindness of heart -
which made him take
an affectionate interest
in every case under his care.

With such qualifications
Mr Malloch cannot fail
to succeed, whether in
private practice or in
the position of a medical
officer to a public hospital.

Joseph Lister F.R.C.S.
Professor of Surgery in the
University of Glasgow.

Another object of interest in the collection is a pair of dissecting forceps used by Lister in Glasgow, then for years by my father, from whom they passed to the surgeon, Dr. Ingersoll Olmsted of Hamilton, Ontario, who has kindly lent them to us. Dr. Olmsted used them for some time until they finally broke—after about fifty years' of trusty service. They have been mended but unfortunately the points do not meet so beautifully as they once did. They were present at the birth of the antiseptic method, and were brought to Canada by the man who, as far as I can ascertain, was the first to follow that method of treatment in Canada.

There are also exhibited the notes my father took in Wards 24, 25, and 17 of the Royal Infirmary of Glasgow from 1st May, 1868, to 1st November. The cases are dealt with thoroughly from admission of the patients until they left the hospital and the notes form an important historical document, for, even in those six months, various modifications in the method of using carbolic and in the nature of dressings are seen. Reports of some of these patients were included in Lister's early papers on the antiseptic treatment. It might interest you to know the nature of the cases found in a surgical ward in those days. Here is the list: "Caries of ankle joint—Syme's amputation, discharged almost well; Caries of carpus, Amputation, well; Suppuration of knee, died; Lacerated and contused wound of foot, well; Crushed toes, well; Burn and laceration of thumb, made Out Door Patient; Syme's amputation, sent to convalescent home well; Removal of [word illegible] and mamma, made outpatient; Excision of elbow joint, to convalescent home well; Excision of elbow joint, Out Door Patient; Tumour, syphilitic in thigh, well; Excision of elbow joint, Out Door Patient; Compound fracture of thigh, well; Compound fracture of toe, well; Inflamed bursa, patellar, well; Amputation in thigh [no remarks]; Smash of hand [no remarks]; Bleeding from ear and scalp wound, well; Caries of tarsus, Syme's amputation, well; Lacerated wound of leg, discharged for bad conduct; Bruise of abdomen and rupture of intestine, died; Abscess of thigh [no remarks]; Fracture of tibia [no remarks]; Strangulated inguinal hernia, died; Periosteal abscess, died; Lacerated and contused wound of heel [no remarks]; Compound

fracture [no remarks]; Amputation of legs, died." These cases occurred at the time when Lister was reducing the mortality to one-third of what it was before the days of carbolic; before the antiseptic period, during the years 1864 and 1866, one death occurred in every $2\frac{1}{5}$ cases of amputation and during the antiseptic period, from 1867 to 1869, only one death occurred in $6\frac{2}{3}$ cases.

In 1912 my father wrote "Some Memories of Mr. Lister," in which he put briefly the changes in the use of carbolic which he witnessed between the autumn of '65 and that of '68; "the crude acid which was first used on a swab, was changed to an injection of the acid dissolved in boiled linseed oil of the strength of one to four, and later to an injection of one to twenty watery solution of the acid. He also changed the outward application from the crude acid to the acid in boiled linseed oil, of a strength varying from one to four to one to eight; then to a carbolized putty; which in turn was succeeded by a carbolic and lead plaster; and finally by a mixture of shellac and carbolic acid, spread on cloth, the surface of which was coated with a thin film of India rubber to prevent its adhesion to the skin."

In the life of Lord Lister by his nephew, the late Sir Rickman Godlee, you may read a long letter about the preparation of the lac plaster written to my father by Lister who was away on a holiday. Thus, in his absence, his house-surgeon treated a patient with compound fracture for the first time with the carbolized shellac plaster.

My father reported in the *Glasgow Medical Journal* for 1868-1869, vol. i., n.s., pp. 107-110, the case of a patient in Lister's ward treated by the antiseptic method, also on Feb. 26, 1869, at Hamilton, Ontario, he opened a gluteal abscess with the same antiseptic precautions, this case being reported in the *Canada Medical Journal* (1869-1870, Oct. 1869, vol. vi, pp. 154-160) of the same year. Both these case reports are to be found in the Glasgow notebook. As far as I can make out this was the first patient treated by the antiseptic method in Canada and it seemed to be the first in North America until I found that Dr. George Derby had treated one patient in 1867 (*Boston M. & S. J.*, 1868, vol. lxxvii, pp. 271-273) and Dr. David W. Yandell, who had been Medical Director in the Con-

federate Army, reported in the *Richmond and Louisville Medical Journal*, 1869, June, vol. vii, no. 6, pp. 651-665, a series successfully treated with carbolic, if not by the latest method of Lister.

The building which contained the Lister ward of the Royal Infirmary was torn down in 1924 in the face of many petitions of protest from scientific bodies all over the world. Fortunately its fittings were preserved and the ward has been reproduced as closely as possible in the wonderful Henry S. Wellcome Historical Medical Museum in London and we exhibit the book of the centenary celebration held there. Some newspaper cuttings about the tearing down of the ward are found in the exhibition cases.

Syme, owing to ill health, resigned and in August, 1869, Lister was appointed to the Chair of Clinical Surgery in Edinburgh and thus began the happiest period of his life. His second stay in Edinburgh was marked by a perfecting of the antiseptic method despite the gloomy wards and operating theatre where his work was carried out. His assistants and students were devoted to him, although a natural shyness on his part and his whole-souled conviction of the seriousness of his task and of the immense responsibilities attached to it made intimacy between student and teacher quite impossible. While he banished sepsis from his wards, many of his surgical colleagues could not see, or did not try to see, the light, and the mortality was almost as great as before amongst their patients even in the same hospital. This state of affairs seems incredible to us now, yet such was the case. Whilst a stream of foreigners, Frenchmen, Germans, Austrians, Danes, Americans, and even Japanese came to learn his methods at first hand and visitors were always present when he made his rounds, yet Englishmen—his fellow countrymen—were conspicuous by their absence. Carbolic acid had been given a very half-hearted trial in London; few took the trouble to study the new treatment from Lister himself and, failing to get good results after merely applying a little to the wound, the London surgeons said the method was useless. We must not blame them altogether, for, be it remembered, the idea that micro-organisms were the cause of putrefaction was so novel and pus in every operation wound was,

and always had been, considered so inevitable that unless they studied the process of healing and understood what was meant by inflammation they were working entirely in the dark. But Lister struggled on, and in referring to those who did not believe in carbolic, he used to remark: "Well, gentlemen, it is no new thing for me to be misunderstood." He was *not* misunderstood by his dressers and clerks even when he lectured upon his mistakes. Only the very greatest men refer to their mistakes, but Lister never thought of himself but only of the patient and the perfecting of his antiseptic system. Nor did he cease to hope and work for a substance which, though killing the germs, would prove to be less irritating to the tissues. It was during this Edinburgh period in December, 1870, that the carbolic spray was first used.

We show a Lister carbolic spray apparatus which was used at the Presbyterian Hospital in this city and is still carefully preserved there. In justice to Lister's memory it is only right to insist on the fact that he obtained good results in Glasgow before he thought of the spray and he considered it the least important weapon of his armament. Though doubting its value, he clung to its use until 1887 lest he should remove any of the factors which counted for success in treatment, but, when once he felt convinced that it was unnecessary, he gave it up.

I cannot refrain from quoting the poem by William Ernest Henley, for twenty months a patient of Lister's in the Infirmary. It was published in the *Cornhill Magazine* in 1875 and was entitled "The Chief," as Lister's followers called him.

His brow spreads large and placid, and his eye
Is deep and bright, with steady looks that still.
Soft lines of tranquil thought his face fulfill—
His face at once benign and proud and shy.
If envy scout, if ignorance deny,
His faultless patience, his unyielding will,
Beautiful gentleness, and splendid skill,
Innumerable gratuities reply.
His wise, rare smile is sweet with certainties,
And seems in all his patients to compel
Such love and faith as failure cannot quell.
We hold him for another Herakles,
Battling with custom, prejudice, disease,
As once the son of Zeus with Death and Hell.

When Sir William Ferguson, Professor of Clinical Surgery at King's College, London, died in 1877, Lister was offered the

position and after much serious consideration he accepted it to the great regret of Edinburgh students. The path of least resistance lay in Edinburgh but Lister was a man with a mission and everywhere except in London the antiseptic system had been adopted. It was clearly his duty to go to London and go he did, knowing full well the disheartening struggle which lay before him. After his four hundred students at Edinburgh what a sad contrast was the mere handful which attended his lectures at King's College! Also in contrast with his sixty beds at the Royal Infirmary he had only twenty-four in London. Again working in the face of opposition from the profession and at first marked coldness on the part of his students, he finally won a great victory. It must have been a wonderful scene at the International Medical Congress at Amsterdam in 1879 when "he was received with enthusiasm that knew no bounds. The whole assembly rose to its feet, and with deafening and repeated rounds of cheers, waving hats and handkerchiefs, renewed minute after minute and time after time: his name was again and again shouted." Professor Donders took him by the hand and said: "Professor Lister, it is not only our admiration which we offer you; it is our gratitude and that of the nations to which we belong." Finally, as younger surgeons sprang up, his ideas and practice were adopted and he triumphed at home.

In 1880 both Oxford and Cambridge conferred doctorates upon him and he was made a baronet in 1883. At the age of sixty-five, that is in 1892, he retired from King's College. Lister represented the Royal Society of London and the Royal Society of Edinburgh on December 27, 1892, midst the huge assembly at the Sorbonne when the scientific world did homage to Pasteur then in his seventieth year. No one in all the world knew better what Pasteur's work had done for science. In his address Lister said: "*Vous avez levé le voile qui avait couvert pendant les siècles les maladies infectieuses; vous avez découvert et démontré leur nature microbienne.*" It is hard to imagine a more moving and imposing scene than when Pasteur rose and embraced Lister. The artist Rixens has depicted on canvas "this brotherly unity of Science in the relief of humanity." The next year, 1893, he received a staggering blow when his wife died of pneumonia after a brief illness, while they were on a visit in

Italy, and he was never the same man again. He retired definitely from surgical practice in 1896 but he never lost interest in his profession or in science, for he was President of the Royal Society from 1895 to 1900 and President of the British Association for the Advancement of Science in 1895.

On 26th May, 1897, a dinner was given in London to Lord Lister by his former house-surgeons, dressers, and clerks. A picture of those who were present, the menu, and the plan of the tables are exhibited. My father went over especially for that dinner.

Later in that summer he paid his second visit to North America, having been present at the International Congress at Philadelphia in 1876. He attended the meetings of the British Association in Toronto and, coming to Hamilton, had lunch at our house. After the meal was over we children went down into the drawing room and I have a vivid memory of an old gentleman with the kindest face I could imagine kissing us all in turn. A Fellow of this Academy, William George MacCallum, now Professor of Pathology at Johns Hopkins University, read a paper at the British Association at Toronto on the haematozoan infections of birds which made a great impression upon Lister, for in a letter to my father of 11th December, 1899, he refers to it again in these terms: "I am just reading some reports given by the Italian workers at Malaria of their recent investigations; and it pleases me to see how they recognize both the trustworthiness and the great importance of MacCallum's observations which I heard him relate at Toronto." A passage in another letter dated December 15, 1901, runs: "It was a wonderfully interesting time at Virchow's Celebration; and I got to see during my few days at Berlin the genial and loving side of his character as I had not known it before." This refers of course to Virchow's eightieth birthday.

Writing about himself to my father, on December 18, 1902, he said: "You ask kindly after my health. I had a rather smart attack of illness last spring which reduced me a good deal. I took a voyage to the Cape of Good Hope to recruit, & this did me much good. But as I am nearer 80 than 70, I cannot expect quite to pick up my former strength. I should be thankful for what I have." And again on December 17, 1904: "As

for me, the seven years that have passed since I then saw you [1897], while they have brought me within no great distance of 80 years of age, have supplied me, especially of late, with abundance of senile infirmities. It is well that we have hope of something far better than even the best that we have known in this world, gloriously beautiful though it is."

His last great public address was the third Huxley Lecture in 1900. It was an account of his early physiological and pathological work as it bore "more or less directly upon the antiseptic system of surgery." In 1901 Lister took the Chair at the second Tuberculosis Congress when Robert Koch startled his audience by stating that human and bovine tuberculosis were separate and distinct diseases. In his guarded appreciation of Koch's address Lord Lister showed that he had continued to follow the advances of bacteriology after he had ceased active work himself.

In 1897 Lister was raised to the peerage and became Baron Lister of Lyme Regis. The Order of Merit was instituted in 1902 and he was made an original member; the only other medical man who has received this high honor is Sir Charles Sherrington, an Honorary Fellow of this Academy and a recent visitor within its walls. In 1907, when he was eighty years of age, the freedom of the cities of London and Glasgow was conferred upon Lister. He retired to Walmer in Kent in 1908, to the country he loved so well, his health and strength gradually declined, he was devotedly cared for by his wife's sister, Miss Syme, and on February 10, 1912, he died peacefully. A funeral service was held in Westminster Abbey, where there is a tablet to his memory; but he was buried as he had requested in West Hampstead Cemetery beside his wife. Thus passed one of the greatest, if not the greatest, benefactors of mankind.

His name liveth for evermore.

LISTER AS PHYSIOLOGIST

JOHN TAIT, M.D., D.Sc., F.R.S.E., F.R.S.C.

Professor of Physiology and Director of Experimental Medicine
McGill University, Montreal

In his article on Baron Lister in the eleventh edition of the *Encyclopaedia Britannica*, Sir Clifford Allbutt says that Lister, appraising his own work, once stated that he had done no more than seize upon the discoveries of the great French scientist, Louis Pasteur, and apply these discoveries to surgery. The writer of the article then goes on to say, "But though Lister saw the vast importance of the discoveries of Pasteur, he saw it because he was watching on the heights; and he was watching there alone." How are we to account for the unique preparedness of Lister to lay hold of the revolutionary work of Pasteur and to apply it with such momentous effect to the treatment of surgical wounds? How had he reached those heights on which he stood watching alone?

The various biographical accounts of Lister all contain references to the early physiological work that he carried out. They make plain that he approached his surgical problems with the peculiar experimental outlook that is acquired through physiological training. In his Huxley lecture, delivered in 1900 before the Medical School of Charing Cross Hospital, he gives a charming review of these introductory researches, and thus outlines the influences that were brought to bear upon him at the commencement of his career:

"As a student at University College I was greatly attracted by Dr. Sharpey's lectures, which inspired me with a love of physiology that has never left me. My father, whose labours had raised the compound microscope from little better than a scientific toy to the powerful engine for investigation which it then was, had equipped me with a first-rate instrument of that kind, and I employed it with keen interest in verifying the details of histology brought before us by our great master. When I afterwards became house surgeon under Mr. Erichsen, I applied the same means of observation to pathological objects."

In other words, through physiology and physiological investigation Lister became what we should now call an experimental pathologist.

Let me digress for a moment to speak of some of his teachers. He makes mention of his father's improvements on the microscope. The father, a London wine merchant, a skilled mathematician and a world-renowned expert on optics, was a fellow of the Royal Society and known to a large circle of scientific people, biologists and astronomers. He had once collaborated with the physician, Hodgkin, in microscopic examination of the red cells of the blood. Those two men together first established the real shape of the red corpuscles, and described their peculiar aggregation in rouleaux (1827).

When the son at the age of twenty-one began his medical course at University College, London, he came under the influence of some unusually able teachers. One was the professor of chemistry, Thomas Graham, whose work on colloids and on diffusion of gases has made his name so famous. The influence of Graham may be detected in many of Lister's subsequent papers. The men, however, to whom he owed most in the way of direct inspiration were Wharton Jones, professor of ophthalmic medicine and surgery, and William Sharpey, professor of physiology.

Wharton Jones, a shy, retiring and somewhat eccentric man, little known to the world at large but held in high esteem by a circle of intimate acquaintances who understood his scientific quality, devoted all the leisure that he could spare from practice to physiological inquiry, working particularly on the blood and on the circulatory system. To him, the original discoverer of amoeboid movement in the blood leucocytes, we owe an elaborate and comprehensive survey of these cells, which he classified into two main varieties, hyaline and granular, distinguishable not only by their appearance and configuration but also by their behavior on a glass slide. This work, published in 1846, i.e., when Lister was a student, forms the foundation of all our subsequent knowledge of these interesting and vitally important blood elements. His researches on inflammation were the direct means of inducing Lister subsequently to pursue the subject.

Lister's chief incitement to scientific investigation came from William Sharpey, to whom his country owes a lasting debt as the outstanding exponent of the experimental method in biology at a time when England lagged far behind her continental neighbours in such inquiries. By the unwonted clarity, by the stimulating quality of his lecture-room exposition, combined with a wide knowledge of the history of the subject down to its latest continental developments, Sharpey was able to inspire his listeners with a profound and often life-long interest in physiological science. The Germans trace the great upgrowth of physiology in their country during the middle and latter half of the nineteenth century to Johannes Müller, of Berlin. The English trace the subsequent great rise of physiology in their country directly to Sharpey. He trained the physiologists, e.g., Sir Michael Foster, Sir John Burdon Sanderson, Sir Edward Sharpey-Schafer, who, by their own work, by the schools they founded and the pupils they in turn sent out, established English physiology, and (through Newell Martin, Foster's pupil, who went to Johns Hopkins) made possible the creation of American experimental biology. Sharpey's influence was not limited to the aspirants to a career in physiology. Men in other branches of medicine, like the surgeon, Lister, even men in other walks of life altogether, were profoundly affected by his teaching.

It was on Sharpey's advice that Lister, intent on the pursuit of surgery, proceeded to Edinburgh after receiving his London degree, in order to study under Syme. The story of Lister's rapid promotion there is known perhaps to most of us. What I wish to speak of this evening is the astonishingly original and important physiological work that he proceeded to carry out in Edinburgh before he was led to the final and greater discovery that has made his name live for ever. When referring in his Huxley lecture of 1900 to this preliminary work, he speaks of it—not without a whimsical touch of regret—as being “probably little known to the present generation.” One of the curious enigmas of scientific history is the slight attention that has hitherto been paid, even by professional physiologists, not to speak of his numerous clinical biographers, to the quality and importance of his investigations in pure physiology. Undertaken mainly in order that he might be able to speak to his

students at first hand of the complicated processes involved, he had to make a strenuous effort simply to find the time for these wholly self-imposed researches. Much of the work was done with the help of his wife, in the back kitchen of the dwelling in Rutland Street in which they started house-keeping. When these early investigations, unexcelled in their experimental quality and in the depth of insight they display, have been properly appraised—and it is beyond the capacity of any one to do so in a brief memorial lecture—we shall be able to see Joseph Lister for the first time in his real greatness. Wide as was the range of these researches—they include the structure of plain muscle, the structure of nerve fibres, the flow of the lacteal fluid in the mesentery, nervous regulation of the arteries, function of the visceral nerves, inflammation, coagulation of the blood, the cutaneous pigmentary system of the frog—wide as was their range, hardly one of his conclusions requires alteration or amendment today. Some of his results that I might readily name still await exploitation, having remained untouched and undeveloped at the point where he then left them.

In order to give a conception of Lister's experimental power and insight, one might select at random almost any aspect of these neglected researches and, by analysis of the contribution thus chosen, demonstrate the high place he achieved for himself in that particular field. I propose to adopt this method and to take his work on blood coagulation on the simple ground that I happen to be rather familiar with all its various antecedents, with its history up to the time of Lister, and after.

The problem of blood coagulation occupies a central position in medicine. It interests not only the physiologist and the pathologist but the practising physician, the surgeon, the obstetrician, and all in equal degree. Having extensive ramifications, it is also far from being a simple problem. In reporting on the question before the Royal Society of London in 1863 Lister says: "My difficulty on the present occasion does not depend so much on the lack of materials as on the complicated relations of the subject, which makes me almost despair of being able, in the short time that can be devoted to a lecture, to give, in anything like an intelligible form, even an adequate selection of the facts at my disposal."

When Lister came to the blood coagulation problem, the outstanding point of interest in the question was, "What induces the blood to clot when it comes out of the body? What first pulls the trigger, as it were, and sets in play the chain of events by which it inevitably changes from a fluid to a solid?" You may seek an answer to this apparently simple question in any of our modern text-books of physiology. Either the issue is avoided, or, if it is handled, you will be put off with carefully guarded answers, full of caveats and qualifications. The books are so anxious to describe the complex composition of the gunpowder that they forget about the percussion cap that is necessary to touch it off. We shall see with what result Lister worked at the question—but then, as I said, Lister's contribution to the subject is forgotten.

The problem, as presented to him, had taken scientific shape some ninety years before (between 1770 and 1776) at the hands of a brilliant investigator, William Hewson, whose untimely death at the age of thirty-six was a great loss to English physiology. Let us throw our minds backwards and picture the problem as it presented itself to the medical men of Hewson's time.

The blood comes out of the vessels. It is exposed to the *air*. What more simple than to suppose that the air acts on it?

Or, if you like, it *cools down*. We know that a solution of gelatine tends to set when it cools.

Again, the blood has come to a standstill. Whipped up in the circulation and kept in constant motion, one part gliding over another, it may have no opportunity, as it were, to stiffen. It might be that the simple condition of *rest* induces coagulation.

All these hypotheses—exposure to air, cooling, rest—had by one person or another been advanced as explanations. It was the merit of Hewson, along with other fundamental work on blood coagulation, first to devise and execute definite experiments to test these several hypotheses. He showed that cooling, instead of hastening, actually retards coagulation. He rapidly froze the blood, thawed it, froze it again, thawed it; it stayed fluid. He warmed it up; it clotted. A different matter this from any solution of gelatine.

In order to test the effect of rest, Hewson ligatured veins in two places, thus bringing the intervening column of blood to a standstill. Often enough no coagulation, but the results were variable and his conclusions indefinite. On the other hand, he could get no valid evidence that mere exposure of the blood to air has the slightest effect upon it. John Hunter made this matter still more definite. He received blood directly from a vessel into a Torricellian vacuum, where it clotted with particular promptitude.

Here was a difficult impasse. As no condition that one could reasonably think of seemed to be the cause, the London surgeon, Sir Astley Cooper, then made a new suggestion: "What if blood, wheresoever it be, has a natural tendency to clot? The impulse to coagulation may not be communicated by any external influence. It may be inherent in the blood, being constantly held in check by the vital action of the vessels." Cooper, as you see, simply inverted the issue. On his supposition there was no need to search for any new condition that acts upon the extravasated blood. What we require to explain—if the matter be susceptible of explanation at all—is not so much the fact of coagulation as the process by which the vessels succeed in keeping the blood fluid.

Sir Astley Cooper carried out no experiments. He merely promulgated a new idea. However, a young graduate who had studied under Cooper, by name Turner Thackrah, decided to take up the whole question afresh. Thackrah's important connection with the problem, like that of Lister, is little known to writers on blood coagulation. He was stimulated partly by his interest in the subject, partly by the fact that a valuable prize, the Sir Astley Cooper Prize, had been offered for the best essay on the subject of blood coagulation. In his consulting room at Leeds, where he had set up in practice, Thackrah worked away at his chosen problem. Fighting against tuberculosis, he died at the age of twenty-eight, but not before he had won the prize and left a memoir on blood coagulation which reveals that he was an experimentalist of a very high order. After his work there could be no question of air, rest or cooling as causes of coagulation. In the end he was driven, one can see doubtfully and with no fervor of conviction, to the provisional conclusion

that Astley Cooper's hypothesis best fitted the conflicting facts. Thackrah's essay was published in 1819.

In 1857 the subject set for the Astley Cooper Prize was again that of blood coagulation. Two essays were sent in, one by Dr. Richardson (later Sir Benjamin Ward Richardson, of public health fame), the other by Ernst von Brücke, professor of physiology in Vienna. The committee awarded the prize to Richardson, who advanced a new conception, viz., that the blood is kept fluid by a slight content of ammonia, the escape of which, when the blood is shed, allows the onset of coagulation. A somewhat analogous idea, involving, however, the gas, carbon dioxide instead of ammonia, had been previously advocated with some apparent experimental support by Sir Charles Scudamore.

Brücke took his stand on Thackrah's work, which he greatly amplified and extended. In speaking of Thackrah's essay he says: "Surely no essay was ever more deserving of a prize." The final conclusion of Brücke, again hesitant, but adopted because he could see no other reasonable way out, was purposely phrased almost in Thackrah's own words: "The influence of the living heart and vessels is the source of the blood's fluidity, and its loss the cause of coagulation." Brücke's experimental findings, widely published and also incorporated in his own textbook of physiology, subsequently exercised much influence in Austria and in Germany.

At this stage, during the excitement of the Astley Cooper award, which caused rather an unusual flurry, enter Joseph Lister. He had read and studied Hewson and John Hunter: he had read Sir Charles Scudamore, Richardson and also Brücke. His first experiments were directed to an examination of Richardson's work, and it was some time before he was able to shake himself quite free of the ammonia theory. As usual, when he had to set aside an alluring and highly circumstantial hypothesis, he did so only after piling up overwhelming evidence against it. In order to preclude all escape of ammonia, a rubber tube, filled with a succession of short segments of glass tube, is looped and tied into a vein. The blood courses through. All the little glass sections are then separately ligated and the tube is removed. Confined in this way the blood clots just as quickly as when exposed to the air. Again, coagulation is

known to be promoted when the blood is stirred with a rod. The stirring, according to Richardson, gives better opportunity for escape of ammonia. By means of an ingenious and complicated piece of apparatus Lister arranges to collect blood and to stir it without any possibility of ammonia escape. The mere stirring is found to accelerate coagulation. But I should weary you with those experiments on the ammonia hypothesis. Lister took much more than an hour to read his own paper. I have to be more brief.

Let us stop for a moment to picture him at work. As first assistant to Syme and later as full professor of surgery in Glasgow, he is subject to sudden call at any hour of the day or night. He has his own private patients. He has his lectures to prepare, constant infirmary duties, engagements of various kinds to keep. He must have gone from place to place, his mind constantly preoccupied with the particular research on hand; and we must also keep in mind the mere quantity of first-class physiological work that he turned out. The marvel is that he could find time to test his fructifying schemes and ideas. Fortunately, the slaughter-house is not far away. The veterinary college, where horses are killed, is also within easy walking distance. He goes to the slaughter-house, makes friends with the butchers. Sheep are being killed. He ties ligatures round their limbs, so as to cause venous congestion, and when the trotters are removed, he gathers them in his bag and hurries off to the back kitchen, where his wife has things ready for him. Or he learns that a horse is to be killed at the veterinary college. He goes there and secures the jugular veins filled with blood. Those who knew Lister tell us that his whole life was one endless succession of experiments. When later his attention was concentrated more upon wounds and upon dressings, he devoted infinite trouble to the selection of the best materials, trying and discarding scores of different things until he got the very best. He constantly went about with dressings and bandages on his own person. It may possibly be news to some of this audience that the introduction of all our routine surgical dressings—lint, gauze, absorbent wool, domet bandages, not to speak of the absorbable catgut to which he devoted so many years of patient labor—is due entirely to Lister's ceaseless experimentation.

Having disposed of the ammonia hypothesis, Lister next turned his attention to Brücke's conclusion that the influence of the living heart and vessels is the cause of the blood's fluidity. He set himself to devise some method of withdrawing it from this influence and, if possible, still keeping it fluid. The blood in the ligated vein of a horse stays fluid. Suspend the ligated vein, open it carefully and look down. The blood remains unchanged. Thanks to the work of the German physiologist, Henle, Lister knew that all the vessels have an inner lining of extremely delicate flattened cells, which we now call endothelium. It might be possible to make cups of these large veins, and pour the blood from one to another through the air. He makes wire frames, sews the outer wall of the vein to these frames, turns down the top edge like a lip, and pours. In this passage through the air the blood is temporarily removed from the vital influence of the vessel—and he may go on pouring, alternately from one to the other—yet the blood does not clot. The evidence is still not conclusive, for the removal has been only temporary. The visceral cavity of the frog, with which blood does not ordinarily come in contact, is however lined with endothelium. He anaesthetizes a frog, which is laid on its back; he opens the abdomen, pins the wall upwards and outwards, and makes a snip into the heart. The blood wells out into the endothelium-lined cavity. It does not clot. The same blood, pipetted out of the abdomen into a glass tube, coagulates. Plainly the issue narrows itself down to some difference between such a material as glass and endothelium.

Whenever coagulation had occurred one and the same condition had always been present. The blood had touched some foreign material.¹ He dips a solid rod into the fluid blood contained in an open vein. A crust of clot forms around the rod. He pushes needles into the veins of his sheep trotters; around the needle the blood coagulates, but not elsewhere. To make a long story short—and I can only refer you to his original paper for the wealth of detail and the ingenious variation of experiment by which he drives home the evidence—the cause of coagulation is neither more nor less than contact of the blood with extraneous foreign matter. The more effective the means taken

¹ This suggestion, first mooted by Thackrah, had been more elaborately handled by Brücke, who finally, but not without qualification, discarded it.

to secure this contact, as by agitation or stirring, the more rapidly it clots. Here was some extraordinary influence, hard to explain on a physical basis, indubitably exerted by a mere touch with particular kinds of material. What this influence was he could only surmise. His training under Thomas Graham suggested some process of a catalytic nature. On the other hand, the absence of coagulation in the uninjured vessel shows merely that endothelium is curiously and wholly neutral with regard to the process. It exerts no vital influence.

His next step was to demonstrate that the cells of the blood are implicated in the process, for in the absence of blood cells he could show that contact with foreign matter is powerless to cause coagulation. But at this critical and important stage he had to lay the matter aside. When he did return to it for a brief period in his later life, he proved that the influence which suffices to determine solid coagulation of the blood outside the body fails to act in the same way upon the circulating blood. The circulatory system contains some mechanism for protection against accidental intravascular coagulation. But I must not pursue the subsequent history of this fascinating subject. My object is to give some conception, however inadequate, of Lister's originality and amazing turn for experiment, in illustration of which I might equally well have selected almost any other of the physiological subjects that he handled at this commencing period of his career. Every touch of his work indicates the master hand.

Those of you who have visited Edinburgh may perhaps have wandered into the Library Hall of the old Arts Building of the university. There, close beside the octagonal table that Napoleon used at St. Helena, is another oblong table surmounted by a glass case containing the various distinctions and decorations that were eventually showered upon Lister by the world at large. Here are his medals; here the different orders conferred upon him by his own and by foreign countries; and here the beautiful casket that was presented to him when he was awarded the freedom of his native city of London. When at the end of his career he came to look back over the scenes of his struggles and of his hard-won victories, Lister decided that Edinburgh should be the repository of these unique tributes. There, under Syme, he had

had his first full introduction to surgery; there he had courted and married Agnes Syme, the devoted companion of all his vicissitudes; there he had renounced his Quaker connection and joined the Church of England; from the University of Edinburgh had come William Sharpey and Wharton Jones, his London teachers; above all it was in Edinburgh that he had realized himself and learned to trust his own powers; there, experiencing all the alternating joy and disappointment, all the strong excitement of intensely interesting yet highly difficult scientific investigation, he had climbed those heights from which, without hesitation and with immediate comprehension, he was in his turn to signal the beacon light that suddenly shone across from France. It is into his early struggles that man puts, if not his best, at least his most significant effort; and just as Sir William Osler, looking back over his nomadic and meteoric career in three countries, decides that his ashes and his library, to the making of which he had devoted a lifetime, shall find a repository in McGill University, where he had polished the weapons that carried him to his later triumphs, so did Lister feel that the scene of his scientific self-realization should retain those proud insignia of homage that the nations had vied with each other in conferring upon him.

As time goes on, we shall come more and more to recognize in Lister an experimental genius of the first order. His trouble was that, being in every instance years in advance of his time, among men of lesser mould he was apt to be misunderstood. He had no gift of brilliant exposition by which he could rivet the attention of an indifferent public, and, with his innate modesty of nature, he had to rely for his ultimate vindication simply upon strenuous application to the work of his choice. The young assistants who loyally banded themselves around him, perceiving his merit, his sterling honesty to fact and the astonishing success of his methods, could guess at but could scarcely analyse his mental processes. They called him "a great thinker." They saw the outward Lister; they could not quite see what Wordsworth calls "the very pulse of the machine." There was, however, one experienced eye that had followed Lister's career from stage to stage with unabating interest. There was one man who could appreciate and closely follow every single experimental

step he took. That was Sharpey. It was to Sharpey that the eager young student had first come with his microscope, seeking to examine for himself the structures of which the teacher spoke. It was Sharpey who had encouraged, advised and stood by him from the beginning, and before this inspiring and trusted counsellor died in 1880, he had the quiet satisfaction of knowing that his brilliant pupil had made what would probably prove to be one of the world's greatest discoveries.

LISTER THE SURGEON

GEORGE DAVID STEWART

President of the American College of Surgeons and former President
of The New York Academy of Medicine

I have been thrilled with the two papers given from such different points of view; the first with the personal touch by one who had actually seen Lister; the other with an analysis of Lister's experiments, so simple and clear that I have learned a deal of physiology, and I am distressed that not more of New York's young surgeons and physicians are in this audience. Perhaps you will bring them here Mr. Chairman if you keep on giving such interesting programs.

Now, I am in an awkward situation because I have been worked almost beyond endurance and have had no time in which to prepare a paper. I am in the position of the clergyman in another land whose wine supply had fallen low—mine is very short too—and he put out a cask and invited his parishioners each to put in a bottle of wine assuring them, in an utterance from his pulpit, that they would not miss so little wine from the bounteous crop the Lord appeared to be sending on that particular year. But one said to himself, 'My wine crop is really not very large and one bottle of water in all that wine won't be noticed.' And another and another said the same. Finally when the clergyman came to taste his donation it was all clear water. Knowing that you had one speak to you who had personal memories almost—yes personal memories—and

another, a scientist, who could analyse so well the scientific experiments of Lister, and still another a scholar and a bookish man, who knows not only the dates but is also familiar with the Victorian social setting of Lister, I made up my mind to throw myself at the mercy of the court and bring one bottle of water to throw among so much good wine, which in reality identifies me with the congregation rather than the pastor.

It was Keen of Philadelphia who said that Lister marked two periods in surgery; that the period before Lister was B.C., and the period after, the *anno domini* of Surgery: a striking way of putting the difference. Yet Lister was not the first man to look for antiseptics or for a method of controlling suppuration, as a matter of fact, the quest had gone on for a long time. That much is known from history and the search must have been pursued for some time before it was even recorded. Gilbert Murray, in his lectures on poetry at Harvard last winter quoted a Frenchman saying: *Le monde naît; Homère chante* and observes that Homer never would have sung in his wonderful inflections, in those beautiful rhythms, unless somebody had been singing before him for centuries, perhaps many hundreds of centuries.

You know that Hippocrates talked of healing by primary union. How he obtained this I don't know. William of Salicet, who died in 1280, one of the North Italian surgeons, also speaks of primary union and says that a man who does not get primary union in his wounds is guilty of reprehensible practice. He used wine as an antiseptic and that is about the only antiseptic I am using to-day, only mine is so strongly depraved by the authorities that it smells badly and can be used for nothing except antiseptic purposes!

Move a long stride forward, and you come to Ambroise Paré. Ambroise did a lot of surgery; he lived long, and was physician to three Emperors of France. I have always wondered why they did not grow suspicious, but he managed to last out while three of them were gathered to their Fathers. He was a very observant surgeon; somebody has called him the 'Father of Military Surgery.' Gunshot wounds had just begun then; the Chinese invented gunpowder for fireworks, not for blowing each other up but the use of gunpowder in war only antedated Paré

by a few decades. And those first guns were a great sight more dangerous to the fellow who held the gun than to the target. In fact guns did not become popular at either end for a long time and gunshot wounds were believed to be *venenati* or poisoned.

Paré treated gunshot wounds with boiling oil; that was the old treatment, I think, of John of Vigo, but I am not quite sure and I speak with a good deal of hesitation in the face of the historians both in front of me and on the stage. You remember why he changed from the use of boiling oil. There had been a big battle and there was not enough boiling oil to go around so he used instead of boiling oil a 'digestive' made of the yolk of egg, turpentine and oil of roses. Then he went to bed, but not to sleep. How often surgeons go to bed but not to sleep, having some surgical case, or a number of surgical cases and wondering what is taking place! I did this when young, I am doing it still, it is one of the reasons I have not been able to prepare a paper for you. In the morning early, Ambroise got up and went around to see the poor fellows that had not had boiling oil and found to his amazement that they were not suffering from pain, that the wounds were not '*tumefied*' and looked better. And there and then, he must have been a good observer, he abandoned boiling oil in the treatment of gunshot wounds forever. But incidently he was using the antiseptic of heat in the boiling oil and in his second dressing turpentine which, as you know, is a valuable antiseptic.

Another story, in passing, on Ambroise Paré which has not much to do with Lister, but it shows that 'proprietary' remedies were in vogue even in those days. In one of his campaigns he heard of balsam that a surgeon of Turin was using that seemed to have great virtue in the treatment of gunshot wounds and made up his mind that he was going to work around that surgeon and find out how that balsam was compounded. So he made friends with the surgeon and tried to pump from him the recipe or prescription wherewith he made his balsam; but was not succeeding very well when the campaign ended. Due to go back to France, he went to this man and said, 'You have a wonderful prescription; is it a very valuable thing in promoting healing in wounds; I am going back to France; my orbit will

never cut yours again in all human probability. Would you mind telling me just how you make that up?' The surgeon, evidently a genial fellow said, 'No, here it is, take two whelps and boil them until the flesh and skin all come off the bones. Then add a pound of earthworms that have been soaked in white wine [what waste!] also oil of lilies and Venice turpentine.' 'That,' said the surgeon of Turin, 'is what I dignify with the glorious name of balsam.' Ambroise does not give his reply but between the lines we read that he said, in modern parlance, 'you're another,' and went off to Paris.

Incidentally, it was probably a very excellent antiseptic, there was the turpentine and there the alcohol. Of course, one doesn't believe that the worms or the whelps had much to do with it, but the heat probably rendered them innocuous and who knows? Once the medicine of the Chinese was under suspicion of being pagan because they used the skin of a toad for heart disease; wider knowledge assures us that in the skin of a toad there is an alkaloid akin to digitalis. And the worms may be useful in antiseptics. They are least as good as some I have seen recommended.

Even when Lister was coming on the scene some three centuries later there was a man in Lyons named Ollier. Every one of you has read in your student days of his operations on bone. Ollier did not believe very much in Listerism, or in the method of Lister, and he was getting mighty good results in bone operations. What do you suppose he was using? Alcohol! Dressing his cases with alcohol and leaving the dressing on for a long time. I have that from a man who saw his work from whom I will read to you in a moment one or paragraphs.

Then Lister came. There is no need of telling the surgeons here how the air was nebulized and how attention was paid to the air of the operating room more than to the hands and instruments. When Lister came on the scene the first thing he did was to look for an antiseptic; finally, selecting carbolic acid because carbolic acid had been used, as related by Dr. Malloch, in the disinfection of sewage at the town of Carlisle.

When I studied they were still using carbolic acid, not in the spray—they had abandoned that—but they were using bichloride in tremendous strengths. Once I was told by my

visiting surgeon to put a strong solution of bichloride of mercury into an abdomen and I did, with disastrous result, and I never did it again. Like Ambroise Paré I kept away from bichloride because of the bad fright that first time, but unlike Ambroise I didn't find something better.

You know how we went through that antiseptic period, then the period of asepsis, and to-day we seem to be in another period of antisepsis; 'mercurochrome 392½,' or something like that is painting every abdomen that presents itself for operation in this great and glorious Republic.

Old Ambroise drained chests and did it, I believe, just about as well as we do. He used perforated tubes, and warns with great feeling against allowing the tube to drop in because, he said, 'if you do, you will have a worse condition to deal with than you had before you started.' One knows well that Ambroise lost one otherwise he could not have written as he does.

Bell was a great surgeon who wrote about 1800 or 1825. Let me give you a few words from his writing: He states that surgeons were delighted to see great quantities of matter spouting when they took their spigot away. Wounds of the belly he considers mortal and feels that there is no reason for recording so common an occurrence as death from these wounds which are of daily occurrence, but thinks when one recovers it should be recorded. You know and I know that there is no use recording these escapes and that it is merely boastful unless one can tell the reason for the escape. Wounds of joints he also considered mortal; amputations only heal in four, five, or six months when they heal at all, and half of them die. Now we send an amputation home in ten days or two weeks. Bell pictures the wards of a hospital: "You look on limbs variously wounded, all of them rotting in their own filth, having carious bones, bleeding arteries, the patients exhausted by diarrhea, fear and pain."

He tells of a French officer who was wounded by a ball which broke the fifth rib twice. The surgeon dilated the wound, introduced a seton, drew it every day for thirty-eight days. Think of that, drawing a great strip of gauze through a lung in the chest. I suppose the lung collapsed. On the thirty-third day he removed a splinter of bone imbedded in the lung after

which the patient recovered, as Keen remarks, both from the wound and the surgeon.

Bell said, continuing, 'There is erysipelas and septicaemia and hospital gangrene endemic in most hospitals,' He winds up in this way: 'What then is the surgeon to do? Is he to try experiments with ointments and plasters while the men are dying? No. Let him bear in mind that no dressings have ever been found to stop this ulcer, that no quantity of wine which a man can stand will ever retard this gangrene. It is a hospital disease. Without the circle of infected walls men are safe. Take them out anywhere to the fresh air, even if you take them on a dunghill.'

They must have been getting better results in Paré's time and in the age of William of Salicet than they were a hundred years or one hundred and twenty years ago or surgery would have perished from the earth. There would have been no surgeons and nobody left to practice surgery on.

Then came the dawning truth, as we know it—Pasteur, Lister. Their relations have been contrasted properly in many books and here to-night. There is no need of going over them. Please don't forget that the microscope had to come before either of them. History often shows that great men or great events must be preceded by other great men or discoveries.

How well did they receive Lister?

Ah, did you once see Shelley plain,
And did he stop and speak to you
And did you speak to him again?

Browning inquires. Here are a few words from a man who saw Lister plain and that is the only real excuse I have found for standing here to-night and taking your time. This communication is written to me by Dr. Paolo De Vecchi, whom I hoped might be present to tell us about it.

His letter says:

In 1870, being a member of the 'Ambulance Turinoise' in the Franco-Prussian War, I was at the Battle of Sedan, where I met Marion Sims and his son Harry, who were members of the Anglo-American Ambulance, directed by MacCormac with a retinue of about thirty English and American physicians. We were in contact every day after the battle was over with the German surgeons under the leadership of Dr. Strumeyer. From what I saw there, then, although the medication of Lister was already known, it was not used and the antiseptics was limited to carbolic acid, salicylic acid, boric acid, according to the different schools, in a rather confused way, and

without any special rule or method. The consequence was that 'tetanus' and 'hospital gangrene' were prevalent and almost always fatal.

After that period I visited almost every German surgical clinic yearly, and found that all sorts of antiseptic treatment was used, but only the Lister spray was generally adopted. Volkmann of Halle was an exception, he often used the Lister method, in his wonderful hospital, as early as 1876, when I saw him last.

In Italy the Lister method was used as early as 1875 at the St. John's Hospital surgical clinic of Turin, by Dr. Novaro, first assistant of Professor Bruni, and at the St. Ursula's Hospital surgical clinic of Bologna by Professor Ruggi, and in Pavia by Professor Enrico Bottini.

Although I know that the method was used in other Italian clinics I have no data to corroborate it, except the case mentioned in his book on Lord Lister by Sir Rickman Godlee, Bart., where he very unkindly mentions Dr. Albanese of Palermo, using the Lister method on the brigands of that island.

In 1878 I went to England to visit some surgical clinics, but I spent most of my time at the Kings College Hospital at the clinic of Mr. Lister, attracted by his unique personal charm and special professional kindness towards the many foreigners frequenting his school.

Of my visit there I published an account soon after my return to Turin, the same year, 1878, 'Contribuzione allo studio della medicazione antisettica del Lister, nelle operazioni chirurgiche,' which was the first, or at least one of the first, publications on the subject made on the Continent. While in England I noticed a general indifference, if not opposition, to the Lister method, in some of the then prominent surgeons, especially were the gynecologists indifferent and in the case of Tait there was open opposition.

On my return from London I stopped at Lyons to visit the famous Ollier, one of the greatest French surgeons, a successful operator in bone surgery, whose clinic I had visited several times because I admired not only the man but his wonderful work. When I told him where I was returning from, the great man in rather a jocular way made fun of the particular systematic way of dressing, with the seven layers of iodoform gauze, beside the green oiled silk over the wound, and the mackintosh over the dressing. Dr. Ollier in his operations used abundantly pure alcohol, one simple layer of carbolic gauze, and a deal of non-absorbent cotton. The results of his medications were marvellous.

When I came to America, two years after my visit to Mr. Lister in 1880, I found that antiseptic medication was generally adopted in the various hospitals I had the opportunity of visiting, but in none of them did I see the rigid application of the Lister method. When, after a few months, I was called to San Francisco, I found almost the same condition in the hospitals there.

In two of my early operations performed in San Francisco, Calif., in 1881, one for 'Extirpation of a large Cystic Goitre,' with a 'Contribution to the Study of Radical cure of Goitre,' published in the *San Francisco Western Lancet*, Editor W. S. Whitwall, M.D., Vol. x, No. 6, August, 1881, and the other 'Subtrochanteric Osteotomy of Volkmann,' Vol. x, No. 9, November, 1881, I mention the method of Lister which I adopted as a rule in every one of my operations then and afterward, until the aseptic method became popular.

As a detail and a curiosity, I mention the fact that when I arrived in San Francisco in 1880, I immediately inquired if the Lister medication could be obtained there, and as no drug store, and none of the instrument dealers were provided with it, I ordered a large shipment from London, at my own risk, because the druggists were not sure of the sale. A fact which turned out a merry joke soon afterward, when the medication became quite popular, with good return to the wise druggist who filled my order.

In another communication Dr. De Vecchi says he recalls that before Lister a hospital was considered a place of torture, and a poor patient hated to go there as a place of suffering and death and he adds that now for the professional man the dictum of Paré, *Je le pansay, Dieu le guarit*, has no more reason to exist.

There is, of course, no need of recalling to you the results in surgery today. I asked one of my house surgeons to pick up 500 operations done on clean cases at a hospital where there are a good many operators, where it is very hard to keep a rigid method and the percentage of infection was very low, most of them not severe; trifling infections that soon passed and did not retard convalescence. Of course, there are a few God-favoured surgeons who never get an infection.

Pasteur, who made Lister's work possible, was not a doctor; he was in an allied science. It is interesting. I presume that is the reason he did not follow up his discovery and apply it to medicine. He did say in one of his communications, if I recall correctly, that it would be a good thing if his discovery of the cause of fermentation could be followed up and applied to medicine. I sometimes think when considering men like Pasteur that perhaps the cause of cancer will not be found by one of our own guild, but by somebody outside of medicine in an allied science or perhaps in one closely allied. It does not much matter and it is a foolish thing to make predictions. Erichsen, with whom Lister worked, said that 'Surgery, in its mechanical and manipular processes, in its art, in fact, is approaching, if it has not already attained something like finality of perfection.' And surgery was just then on the eve of the greatest change that surgery has ever seen. Dear old Ambroise Paré in his book, where it stands for any one who wishes to read, says that he had done his work in such fashion that he did not believe anybody who followed after him could hope to add anything, unless perhaps some little trifling detail of mechanical perfection.

Often in recent years you have heard that asepsis has gone as far as it could. That perhaps is why experimenters are at work trying to find a new antiseptic.

George Eliot, in *Middlemarch*, speaking of Lydgate and his hope of making a great anatomical discovery, says that new

pathological worlds then lay ready for the discovering microscope and, later, as holding less of promise for discoverers in the pathological or physiological domain. There too prophecy was vain!

All the grosser worlds may have been discovered unless we can make our machines travel to the stars, and we may. But surely in the realm of the infinitely small there are worlds open for invasion and investigation today just as surely as there ever were. We are not at the end of medicine! It will never become static, but must remain dynamic.

Havelock Ellis, of whom I am very fond, says: 'There can be no life without movement, and there can be no world without tradition. As Heraclitus knew at the beginning of modern philosophy we can never bathe twice in the same stream. As we know, the stream runs in an unending circle. There is never a moment when the new dawn is not somewhere breaking over the earth and never a moment when the sunset ceases to die. It is well to greet the new dawn hopefully, not hastening toward it with undue speed, nor yet to leave without regret the dying light that once was dawn.'

LISTER IN RELATION TO THE VICTORIAN BACKGROUND

F. H. GARRISON

Library of the Surgeon General's Office, Washington

The Victorian period began with the accession of Queen Victoria (1837), and ended roughly with the close of the 19th century (1901). The noble civilization created in this period was already moribund and met its end in the World War. What do we mean by a civilization? There is no better definition than the remark of Thucydides with reference to the Athenians—when the civilian in cities does not bear arms against his neighbor, i.e., does not usurp police and military functions. Judged by this test, islets of civilization in any period are, in the memorable words of Amiel, "fugitive attempts to reconstruct a dream, whose only end is beauty aspirations toward a

harmony of things which every day reality denies to us, and of which art can only give us a glimpse." In this delicate *milieu*, he says, "all realism is suppressed as brutal like the shrill cock-crow which breaks the spell of all enchantment and puts the fairies to flight." Civilization, something more than "man tamed or domesticated," is thus an environment created by the civilized, even in periods which congratulated themselves upon "the abundance of food and the scarcity of hanging." Of the Victorian civilization, Lister was a child, the creature, to some extent, of his environment. During his lifetime, there was a progressive movement among the English people toward the extension of liberty and the franchise (Reform Bills of 1832, 1864 and 1884), after which only the forms and trappings of monarchy remained; toward dis-establishment of churches, whereby religion, no longer state-financed and state-controlled, became a matter of private conscience; toward colonial expansion, which, after the Sepoy Mutiny (1857-8), was tempered by an earnest desire, among the best, to respect and deal gently with the religious feelings, ethnic traits and ancestral traditions of British subjects in India and elsewhere. This note was sounded in the early writings of Kipling (1886-99), of which *Kim* (1901) may symbolize the intense interest in "strange lands and people" which Robert Schumann allocated to little children and which became one of the main interests of grown-ups during the 20th century. With the Spanish American War, a new type of American came into the foreground, the type of Walt Whitman's "athletic democracy," personified in Theodore Roosevelt. Even hereditary monarchs strove to assimilate themselves to this type, and the Victorian era was at an end. The newer slogan was:

Matthew Arnold, he's all right!
Full of sweetness, full of light.

The tone and temper of "good society" in the Victorian period, typified in the personality of the Queen, made for sobriety, decorum, an extreme conventionality, which, if at times artificial or even stupefying, was, like the administration of the law, not anything superimposed, but a voluntary, almost codified expression of public sentiment. This influential sobriety extended even to the court of Berlin in the earlier days. The writings of

Theodor Fontane, the poet of the Prussian capital, contain no less than 55 poems and ballads on English themes. The lines beginning

Jedes, Frühjahr das erste Tiergartengrün

convey the identical, sober-sided "*Residenz*" atmosphere of old Washington in the eighties, where I have seen the aged George Bancroft and members of the Cabinet on the greensward back of the White House, gravely listening to the music of the Marine Band on summer evenings. But the Victorian people were none the less buoyant, self-possessed, self-centred rather than self-determined, confident, "wonderfully decent," and far removed from the "Victorian" of our recent caricaturists. Their fun was the fun of John Leech and DuMaurier. The law of their being was, not "pep" and "the loud laugh that speaks the vacant mind" but *il y a des gaietés intimes qu'on ne peut répandre au dehors*.¹ The pathos of the belated Victorians, so well depicted by Henry James, Galsworthy, Leonard Merrick, Rose Macaulay, Margaret Kennedy, is, like that of all waifs and refugees of the great war, the pathos of "their world gone," a pathos which became black tragedy in Austria, Russia and other areas of the Eastern front. The gloomy prognostics of Spengler or Charles Richet (Idiot Man) illustrate the dictum of Anatole France: *L'avenir est caché même à ceux qui le font*.

In character, Lister was essentially English, Victorian in his feeling for sobriety, decorum and good taste, his general outlook on life one of extreme simplicity. The peculiar cast of his mind is sensed in his early investigations of histology, haematology, pathology and bacteriology, things most unusual in a surgeon of his period and done entirely with his own hands in small private rooms at his own expense. He was one of the few surgeons with a specific talent for dealing with scientific ideas as such. Ultimately, he had an important message to convey, the most important, save anaesthesia, in all the history of surgery, and thereupon, as a disturber of the old order of things, his troubles began. Not without opposition, *non sine dolore*, he got his first innings from Scotland, a democracy founded on the old clan system, where proverbially "all men fare alike;" a people

¹ Prosper Mérimée.

of essentially masculine type (women somewhat in the background), capable of jocund pleasantries when "sitting pretty," of dour reserve if crossed; their humors at once blithe, arch, mordant, pawky, defined by Heine as even *finster* (sombre).² The humblest peasant, Wilkie Collins relates, will resent intrusion as invasion of his territory, but should a woman give him her confidence, nor rack nor thumbscrew could wrest her secret from him. In Scotland, Lister married Agnes Syme, perhaps the most loyal, faithful, helpful wife that ever physician had. When he went down to London, he looked forward to the experience as "a cold plunge into a sea of troubles" and his intuition proved to be correct. His Edinburgh classes of 400 fell to a corporal's guard of 10 or 20, to him "a humiliating experience." Students avoided his clinics, since what he taught was not required to pass examinations. He did not live in the fashionable medical quarter (Harley Street) but opposite Regent Park. Only his clinical clerks were permitted to handle his cases, even when referred by consultants. These things, seemingly trivial, militated against him. When he operated on the patella, there were surgeons who opined that he was liable to prosecution for malpractice. In his hospital, the nursing service was "farmed out" to the Anglican sisters of Saint John, "much given to ritual, frigid rules, repressive formality and petty restrictions." These sisters were required to follow him from bed to bed, with a towel and a basin of water, in which all hands had to be dipped before examining a patient. Of their "smiling stabs" and other sniping, Sir St Clair Thompson observes that "Lister exhibited no resentment, never retaliated, and only showed how he felt it by the little gasping sigh we all learned to know and to respect as his only sign of sorrow or resentment." He had the "unblamed serenity" which, in the view of the Victorian writers, makes "a wide gulf between the spiritual aristocrat and the vehement." The "passionate ego of unimportant people" was not his.

True to type, Lister won out magnificently in the end by ignoring the pinpricks. Although in England Paget, Simpson, Bantock, Savory were either indifferent or hostile, his fame

² For example, Lord Braxfield: "Ye're a verra clever chiel, man, but ye wad be nane the waur o' a hanging" (Lockhart's *Scott*, 1845, p. 425); or Stevenson: "We are warned against bad judgments, but the admiral was certainly *not* sober."

was firmly established on the continent, after the war of 1870, by Thiersch, Volkmann, Stromeyer, Bardeleben, Nussbaum, Es-march, Tillmanns, Trendelenburg and von Bergmann in Germany, Saxtorph (Copenhagen), Tilanus (Amsterdam) and Lucas Championnière (Paris). A copy of verses by Stromeyer conveys the sentiment of Germany, at the same time, the artless simplicity and sincerity of the period:

Mit Staunen sieht der Welt dich an,
Was Lister, Du für uns gethan,
Vernichtet ist des Todes Macht,
Wo Deine Antiseptik wacht.

Die Krone der Unsterblichkeit
Hat Dir Germania geweiht,
Und ruhmvoll Dir zu Seite steht
Jetzt Richard Volkmann, Dein Prophet!

Yet at the great London International Congress of 1881, at which Paget and Jenner presided, and Virchow, Pasteur, Huxley, Raynaud and Billings were leading speakers, there was little enthusiasm. The introduction of steam sterilization by Koch (1886) and of a general aseptic ritual by von Bergmann (1891) turned the tide. Esmarch's *Dauerverband* was surgically clean because aseptic. Lister's climb to the asepsis adumbrated by Hippocrates, Hugh of Lucca, Theodoric, Mondeville and Paracelsus³ was slow and plodding, but the real test of his ultimate reasoning (Antisepsis=Therapy; Asepsis=Prophylaxis) came on the Western Front. Back of the germ-laden trenches of France, there could be no white-robed aseptic ritual. It was necessary to go back to first principles. Surgeons had, in fact, to *treat* the wounds, as in the period before 1867-70, whether with Carrel-Dakin, bipp, ipp or dichloramine-T. Until wound-excision was evolved, the slogan was "back to Lister." Today, Listerism connotes everything from Listerine and well-scrubbed hands to the white-enamelled kitchen, bath-room or surgery or even pure cultures of extravital tissue growths; for Lister was the first to obtain a pure culture (lactic acid bacillus) between Klebs and Koch. His total achievement may be estimated in

³ Asepsis in the past, e.g., in the pioneer cabins in which McDowell performed his ovariectomies, was a matter of sheer luck. In such hospital wards as Tenon found in the Hôtel Dieu in 1788, or Semmelweis in Vienna (1846-7), or Lister in Glasgow and Edinburgh, the dice were loaded against the patient, as in the trenches of the Western Front. Where infection was a foregone conclusion, antisepsis was the only remedy.

the light of the tribute paid by Willard Gibbs to his great teacher Clausius: "Such work as that of Clausius is not measured by counting titles or pages. His true monument lies, not on the shelves of libraries, but in the thoughts of men and the history of more than one science." Lister's accomplishment places him at the very head and forefront of English medicine in the 19th century. Of this there can be no doubt in contemporary opinion:

"Lister made possible the new surgery, beyond all question the most beneficent art mankind has ever practised. So long as there are men to live and suffer, so long will Lister be there to heal them, to hold the gates of life ajar."—Sir Berkeley Moynihan.

"Lister achieved more for mankind than all the surgeons from the beginning of history."—Sir StClair Thompson.

Sherrington spoke of his "triumphant career of experimentation and observation in the laboratory and ward, which, with a really surprising speed and mastery, winged surgery for that which she is today, a far-flighted angel of healing the civilized world over," Cushing likens him to Lincoln as "the liberator of surgery from the shackles of sepsis." Among those whose home is, in Carlyle's phrase, "the dwelling place of light," Lister belongs with a few chosen spirits, distinguished, like himself, by the rare and magnificent trait of self-forgetfulness. One thinks of him in the immortal words spoken to the Athenians long ago:

And having each given his body to the commonwealth, they receive instead thereof a most remarkable sepulchre; not that wherein they are buried so much as that other wherein their glory is laid up, on all occasions, both of word and deed, to be remembered forevermore: FOR TO GREAT MEN THE WHOLE WORLD IS THE TOMB; and their virtues shall be testified not only by the stone inscription in their home-lands, but in all lands wheresoever, in the unwritten record of the mind, which, far beyond any monument, will remain everlastingly.

EXHIBITION OF WRITINGS AND MEMORABILIA OF LISTER

(Those items marked with an asterisk were lent by the Librarian)

1. Photograph of Upton House: The Birthplace of Lord Lister (after a drawing by Mary Lister).

2. Lister's First Paper,
Observations on the Contractile Tissue of the Iris.
By Joseph Lister, Esq., B.A. *Quart. J. Microscop. Sci.*, 1853, i, 8-17.
3. Photograph of Joseph and Agnes Lister,
Lister married Agnes, eldest daughter of Prof. Syme,
in 1856.
4. Photograph of Lister, aged about 28 (from a daguerreo-
type).
5. Photograph of James Syme, Professor of Surgery at
Edinburgh.
6. Lister's paper on Inflammation,
Art. xxvii.—On the Early Stages of Inflammation.
By Joseph Lister, Esq., F.R.C.S. Eng. and Edin.,
Assistant Surgeon to the Royal Infirmary of Edin-
burgh. Communicated by Dr. Sharpey, Sec.R.S.
Received June 18, 1857. (Abstract.) *Proc.Roy.Soc.*
Lond., 1857, viii, 581-587.
7. Pre-Listerian Conditions,
The Principles of Surgery . . . By John Bell, . . .
Edinburgh, 1801, i, pp.674, (opened at pp. 80-81).
8. Before the Dawn of Antiseptic Surgery,
Joseph, Baron Lister Centenary Volume (1827-1927)
Edited for the Lister Centenary Committee of the
British Medical Association by A. Logan Turner,
M.D., LL.D. Edin. Edinburgh and London, 1927,
pp.182, (opened at pp.36-37).
*‘Before and After Lister’ by W. W. Keen. Re-
printed from: *Science*, 1915, n.s., xli, 845-853 and
881-891.
9. Article on Anaesthetics by Lister,
A System of Surgery . . . ed. by T. Holmes, M.A.
Cantab., 3d ed., 1883, iii, Chap. on Anaesthetics,
pp.598-624, (opened at Part i, written in 1861).
10. Lister's Croonian Lecture,
On the Coagulation of the Blood. *Proc. Roy Soc.*
Lond., 1862-1863, xii, 580-611.
11. Some of Pasteur's papers which showed Lister the way,
Physiologie Végétale.—Expériences et vues nouvelles

sur la nature des fermentations. *Comptes Rendus. Acad. Sci.*, Paris, 1861, **LII**, 1260-1264. Chimie physiologique.—Recherches sur la putréfaction. *Comptes Rendus. Acad. Sci.*, Paris, 1863, **LVI**, 1189-1194.

Chimie physiologique.—Études sur les vins. Deuxième partie: Des altérations spontanées ou maladies des vins, particulièrement dans le Jura. *Comptes Rendus. Acad. Sci.*, Paris, 1864, **LVIII**, 142-150.

12. The points Lister gained from Pasteur's writings, *Lord Lister*. By Sir Rickman John Godlee, London, 1917, (opened at pp.176-177).
13. Photograph of the Surgical Hospital and the Fever Hospital of the Glasgow Royal Infirmary as they were about 1890.
The white crosses mark Lister's wards.
14. Dissecting forceps used in Glasgow in the '60's by Lister, for years by A. E. Malloch, of Hamilton, Ontario, and then by Ingersoll Olmsted who has kindly lent them.
15. Photograph of Professor Lister, Glasgow, 1868.
- *16. A. E. Malloch's (1844-1919) note book of Lister's cases written as house-surgeon in Glasgow, 1868. Opened to show names of patients, diseases, and result.
17. The first papers on the antiseptic method,
On a New Method of Treating Compound Fracture Abscess, etc., with Observations on the conditions of suppuration. By Joseph Lister, Esq., F.R.S., Professor of Surgery in the University of Glasgow. Part I. On Compound Fracture. *The Lancet*, 1867, **I**, 326-329. On the Antiseptic Principle in the Practice of Surgery. By Joseph Lister, Esq., F.R.S., Professor of Surgery in the University of Glasgow. *The Lancet*, 1867, **II**, 353-356.
- *18. Lister testimonial (1868) to A. E. Malloch, who was his house-surgeon in 1868, the first of a volume of autograph letters.
19. First(?) surgical patient in North America treated by the antiseptic method,
Carbolic Acid in Surgery. By George Derby, M.D.,

Surgeon to the Boston City Hospital. *Boston M. & S. J.*, 1868, LXXVII, 271-273.

20. First series of surgical patients in North America treated by the antiseptic method,
Art. I.—Thirty Surgical Cases Treated with Carbolic Acid as a Dressing. By David W. Yandell, M.D., formerly Professor of Science and Art of Medicine, University of Louisville, Ky. *Richmond & Louisville M.J.*, 1869, VII, 651-665.
21. First series of surgical patients in Canada treated by the antiseptic method,
Reports of Cases read before the Hamilton Medical and Surgical Society on the 6th Oct., by Dr. Arch. E. Malloch. *Canada M.J.*, 1869-1870, Oct. 1869, VI, 154-160.
22. Introductory lecture delivered in the University of Edinburgh, November 8th, 1869. By Joseph Lister, F.R.S., Professor of Clinical Surgery. *Brit. M.J.*, 1869, II, 601-604.
23. Remarks on a Case of Compound Dislocation of the Ankle with other injuries; illustrating the Antiseptic System of Treatment. By Joseph Lister, F.R.S., Regius Professor of Clinical Surgery in the University of Edinburgh. Edinburgh, 1870, pp.35, reprinted from: *The Lancet*, 1870, I, 404-406; 440-443; 512-513.
24. Observations on Ligature of Arteries on the Antiseptic System. By Joseph Lister, F.R.S., Professor of Surgery in the University of Glasgow, etc. Reprinted from: *The Lancet*, 1869, I, 451-455.
25. Photograph of Lister's carbolic spray apparatus.
26. Lister carbolic spray apparatus used in the dressing of wounds and operations. Kindly lent by the Presbyterian Hospital.
Lister first used a spray in 1872 and gave it up in 1887.
27. Lister's obituary notice of his father Joseph Jackson Lister (1786-1869) who gave us the achromatic microscope as we know it,

- II.—Obituary Notice. Of the late Joseph Jackson Lister, F.R.S., Z.S., with special reference to his Labours in the Improvement of the Achromatic Microscope. Contributed in a letter to the President of the Royal Microscopical Society, by Joseph Lister, F.R.S., Professor of Clinical Surgery in the University of Edinburgh. *Monthly Microscop. J.*, 1870, III, 134-143.
28. A bacteriological paper by Lister,
A Further Contribution to the Natural History of Bacteria and the Germ Theory of Fermentative Changes. By Joseph Lister, F.R.S., Professor of Clinical Surgery in the University of Edinburgh. *Quart. J. Microscop. Sci.*, 1873, n.s., XIII, 380-408.
- *29. Professor Volkmann on Antiseptic Osteotomy, pp.8, reprinted from: *Edin. M.J.*, 1875, II, 794-799.
Introduction by Lister.
30. Picture of Lister's original tubes for tests of Lactic Acid Fermentation. In a pamphlet entitled: 'The Custodianship of Rush-Jenner-Pasteur-Lister-Curie Mementos in the Cabinet of the College of Physicians of Philadelphia', n.d.
31. Photograph of Lister's wards in the Royal Infirmary, Edinburgh.
32. Art. I.—Demonstrations of Antiseptic Surgery, before Members of the British Medical Association, in the Operating Theatre of the Royal Infirmary, 4th and 5th August 1875. By Joseph Lister, F.R.S., Professor of Clinical Surgery in the University of Edinburgh. *Edin. M.J.*, 1875, XXI, 193-205.
33. An Address by Lister to a graduating class, Edinburgh. *Edin. M.J.*, 1876, XXII, 280-285.
34. Art. 23—On the lactic fermentation, and its bearings on pathology. By Joseph Lister, F.R.S. *Trans.Path. Soc. Lond.*, 1878, XXIX, 425-467.
35. On the Relations of Micro-organisms to Disease. An address delivered before the Pathological Section of the British Medical Association at Cambridge, August 12th, 1880. By Joseph Lister, F.R.S., Professor of

Clinical Surgery in King's College, London, pp.16, reprinted from: *Quart. J. Microscop. Sci.*, 1881, n.s., xxi, 330-342.

36. Sul Trattamento delle Ferite. Discorso pronunciato nella Sezione Chirurgica del Congresso Medico Internazionale al terminare della Discussione sull' argomento—8 Agosto, 1881—Traduzione dall' Inglese del Dott. G. Fedeli. Pp.22, translated from: *Trans.Internat.Med. Cong.*, Lond., 1881, 369-383.
37. Antiseptic Surgery. Report of Remarks made before the Surgical Section, during the adjourned discussion on Dr. Hodgen's paper. By Joseph Lister, F.R.S., Professor of Clinical Surgery in the University of Edinburgh. (President of the Section.) *Trans.Internat. Med.Cong. of Phila. of 1876*, Philadelphia, 1877, 535-544.
- *38. Letter from Dr. Paolo De Vecchi to Dr. Archibald Malloch, dated Dec. 7, 1927, concerning Lister's antiseptic dressing.
39. Contribuzione allo studio della medicazione antisettica del Lister nelle operazioni chirurgiche del Dottor Paolo De Vecchi. Torino, 1878, pp. 30, reprinted from: *Indipendente di Torino*, 1878, xxix, 497; 513; 531; 548.
40. An Address on the Catgut Ligature delivered before the Clinical Society of London, January 28th. By Joseph Lister, F.R.S., Surgeon to King's College Hospital; Surgeon Extraordinary to the Queen; President of the Society. *Brit.M.J.*, 1881, i, 183-185.
41. An address on Corrosive Sublimate as a Surgical Dressing. Delivered at the opening meeting of the Medical Society of London, October 20th, 1884. By Sir Joseph Lister, Bart., F.R.S., Professor of Clinical Surgery in King's College. *The Lancet*, 1884, ii, 723-728.
42. The present position of antiseptic surgery. Sir Joseph Lister. *Verhandlungen des x. Internat.med.Cong. Berlin, 4-9 August, 1890*, Berlin, 1891, i, 28-35.
43. Photograph of Lord Lister, President of the Royal Society (1895-1900).

44. The Sorbonne (1892)—Pasteur and Lister,
Photograph of the central portion of the picture by
M. Rixens representing the ceremony at the Sor-
bonne, Dec. 27, 1892.
- *45. Remarks on the Treatment of Fractures of the Patella
of Long Standing. By Lord Lister, F.R.S. Reprinted
from: *Brit.M.J.*, 1908, I, 849-850.
- *46. Reproduction in color of a portrait of Lister by Mr. J.
H. Lorimer, R.S.A., (1895). *Brit.M.J.*, July 16, 1927.
- *47. The Portraits of Lister. *Brit.M.J.*, 1927, II, 110.
- *48. Large engraving of portrait of Lister by Lorimer (1895),
considered to be the best one.
- *49. *The Collected Papers of Joseph, Baron Lister* . . . vol.
I, pp.429, vol. II, pp.589, Oxford, 1909.
- *50. A scrap-book made after Lister's death (1912) by Sir
William and Lady Osler to give to A. E. Malloch.
51. Osler's account of Lister's funeral,
In 'Men and Books.' By Sir William Osler. *Can-
adian M.A.J.*, 1912, II, 343-344.
52. Photograph of Lister's grave in West Hampstead Ceme-
tery, London.
- *53. The essay on Lister which won the prize given by A. E.
Malloch for competition amongst medical students of
the Johns Hopkins Medical School,
Lister Prize Essay. *The Life and Work of Lister.*
By Charles C. W. Judd, Student of Medicine, the
Johns Hopkins University. Balt., 1910, pp.32, re-
printed from: *The J. H. H. Bull.*, 1910, XXI, 293-
304.
- *54. *Lord Lister.* By Sir William Macewen, M.D. (Glasgow),
LL.D., F.R.C.S. (Hon.), D.Sc. (Oxon.), F.R.S. Royal
Institution of Great Britain. Weekly Evening Meet-
ing, June 7, 1912, pp.19.
- *55. Some Memories of Mr. Lister. By Archibald E. Malloch,
M.D., Hamilton, Student and House Surgeon, 1864-
1866. (Read at the Academy of Medicine, Toronto,
April 2, 1912, by John Ferguson, M.D.) pp.6, re-
printed from: *Canadian J.M. & S.*, 1912, XXXI, 331-
336.

- *56. Banquet to Lord Lister from his house-surgeons, clerks, and dressers. London, 26th May, 1897,
Picture of those who were present,
Key to the picture,
Menu of the banquet,
Seating plan of the banquet.
- 57. *Experiments on Animals*. By Stephen Paget. With an Introduction by Lord Lister. 3rd and revised ed., New York, 1927, pp.387.
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- *84. Photograph of tablet to Joseph Lister, in University College Hospital, London.
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- 92. Photograph of the New Surgical Hospital of 1861. Interior of Lister's Male Accident Ward (No. 24). Lister ward, Glasgow Royal Infirmary (built in 1861, demolished in 1924).
- 93. Photograph of a Section of the Lister ward set up at the Wellcome Historical Medical Museum, London.

94. Photograph of the basement walls of Lister's ward in Jan. 1927,
The ward was demolished in the early spring of 1924.
- *95. Newspaper reproduction of etching by Mr. W. C. Appleby showing part of the Royal Infirmary of Glasgow, containing the Lister ward in the process of demolition (no title of paper given).
96. *Lister and the Lister Ward in the Royal Infirmary of Glasgow, a Centenary Celebration.* Glasgow, 1927, pp. 132.
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